

Natural Oil Seeps and the *Deepwater Horizon* Disaster: A Comparison of Magnitudes

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Some reports in the media attempt to downplay the significance of the release of oil from the *Deepwater Horizon* accident by arguing that natural oil seeps release large volumes of oil to the ocean, so why worry? Lets look at the numbers.

Natural seeps can be thought of as natural springs from which liquid and gaseous hydrocarbons (hydrogen-carbon compounds) leak out of the ground. Oil seeps are fed by natural underground accumulations of oil and natural gas. Satellite images have identified hundreds of areas where oil is likely to seep from the Earth's crust into the waters of the Gulf of Mexico. These seeps occur over a wide range of the 615,000 mi² (1.6 million km²) Gulf. A 2003 study by the National Research Council and a 2009 report by oil spill expert Dagmar Schmidt Etkin indicate that between 560,000 and 1,400,000 barrels per year (1,534 to 3,835 barrels per day) seep into the Gulf of Mexico from natural sources. Dozens of natural seeps have been identified off the coasts of Louisiana and Texas, some in the region of the Deepwater Horizon site.

These natural seeps are quasi-continuous or chronic inputs that represent a "background" rate of oil input that have been in existence for hundreds or thousands of years. As the term "seep" implies, the rate of release from these sources of oil is much smaller than human spills that often release large, concentrated pulses of oil. One of the largest and most intensively studied seepage areas lies off Coal Oil Point, in Santa Barbara County, California. *Individual seeps* in this area release an estimated 80 to 100 barrels (3,360 to 4,200 gallons) of oil per day; *Deepwater Horizon* is releasing 12,000 to 19,000 barrels per day (Figure 1).

The *Deepwater Horizon* site releases 3 to 12 times the oil per day compared to that released by natural seeps across the entire Gulf of Mexico. By May 30, the *Deepwater Horizon* site had released between 468,000 and 741,000 barrels of oil, compared to 60,000 to 150,000 barrels from natural seeps across the entire Gulf of Mexico over the same 39 day period.

Natural seeps are not constantly active; the volume of oil released can vary considerably throughout the day and from day to day. As a result, only a small area around the source is actually exposed to "fresh" non-degraded oil, which is its most toxic state.

Marine and coastal organisms and ecosystems presumably have adapted to the natural rate of oil input. Indeed, most organisms living in the regions near natural oil seeps have no special adaptations to the oil. Researchers at Woods Hole Oceanographic Institute and the University of California/Santa Barbara studied natural seeps off the coast of California. They found that as the oil moved upwards in the water column, a wide range of microbes consume the oil and produce intermediate products, and that those intermediate products are then converted by another group of microbes to natural gas and other compounds. Their research suggests that oil from natural seeps normally stays in the water for between ten hours to five days.

Oil that does make it to the surface from natural seeps can spread out very widely. One gallon of oil can spread out to cover more than a full square mile, forming an extremely thin film on the surface, about one-hundredth of a millimeter thick. Under these conditions, the oil is not hazardous. Some of the oil in that thin sheen evaporates within seconds or minutes after it reaches the surface.

A sudden, concentrated and massive pulse of oil from an event such as the *Deepwater Horizon* disaster presents a fundamentally more acute stress to marine and coastal systems. The amount, rate and spatial concentration of crude oil released from such an event overwhelm the natural mechanisms of oil dispersal and breakdown, producing the significant ecological effects that we observe.

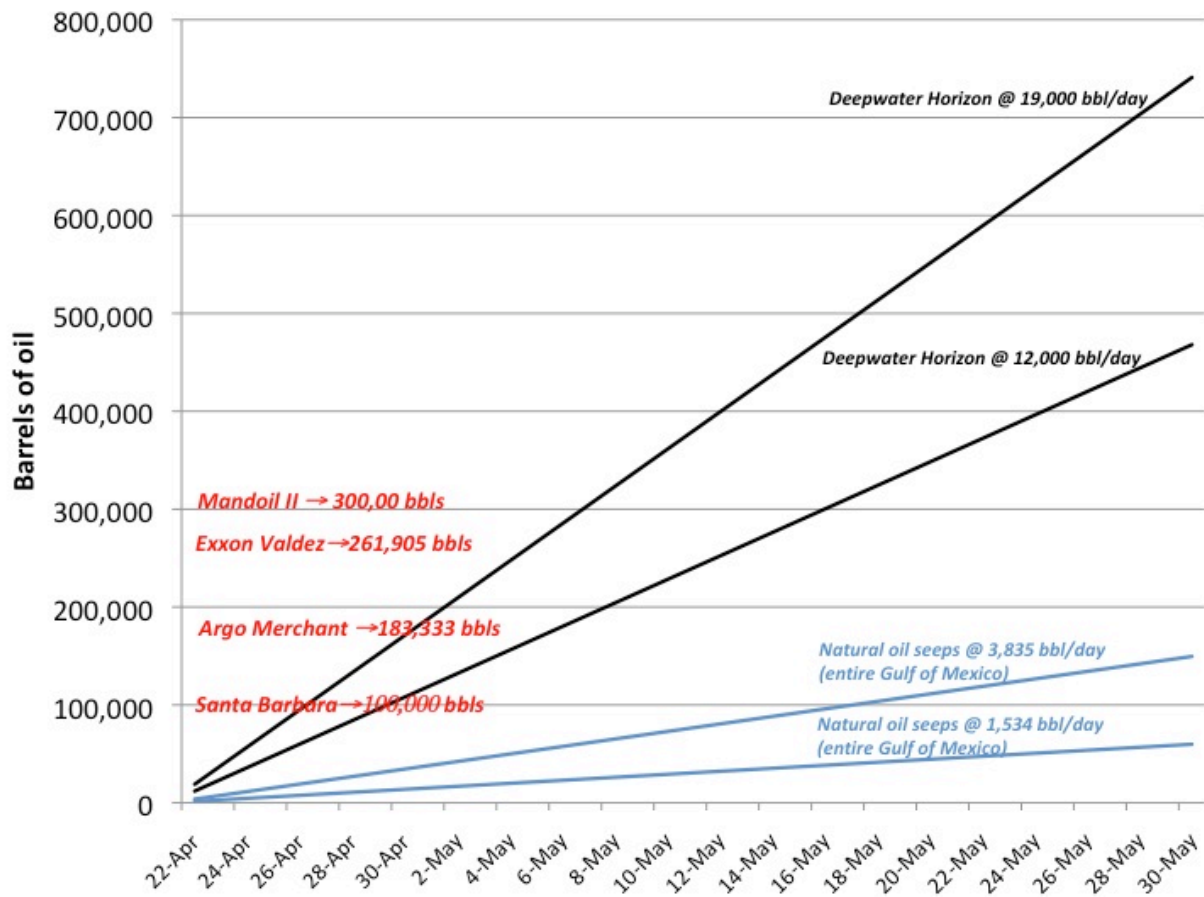


Figure 1. Estimates on the quantity of oil released from the Deepwater Horizon accident, from natural oil seeps in the entire Gulf of Mexico, and from some notable historic U.S oil spills. Data sources: Cleveland, 2010; natural seeps: Schmidt Etkin, 2009 and NRC, 2003; U.S. oil spills: Schmidt Etkin, 2009. Figure adapted from that in Cleveland, 2010.

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